



## DEPARTMENT OF COMMERCE

### National Oceanic and Atmospheric Administration

[RTID 0648-XB439]

#### **Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to the Palmer Station Pier Replacement Project, Antarctica**

**AGENCY:** National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

**ACTION:** Notice; issuance of an incidental harassment authorization.

**SUMMARY:** In accordance with the regulations implementing the Marine Mammal Protection Act (MMPA) as amended, notification is given that NMFS has issued an incidental harassment authorization (IHA) to the National Science Foundation (NSF) to incidentally harass, by Level B harassment and Level A harassment, marine mammals during pile driving activities associated with the construction of the Palmer Station Pier Replacement Project in Anvers Island, Antarctica.

**DATES:** This Authorization is effective from October 27, 2021 through October 26, 2022.

**FOR FURTHER INFORMATION CONTACT:** Robert Pauline, Office of Protected Resources, NMFS, (301) 427-8401. Electronic copies of the application and supporting documents, as well as a list of the references cited in this document, may be obtained online at: <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>. In case of problems accessing these documents, please call the contact listed above.

#### **SUPPLEMENTARY INFORMATION:**

##### **Background**

The MMPA prohibits the “take” of marine mammals, with certain exceptions. sections 101(a)(5)(A) and (D) of the MMPA (16 U.S.C. 1361 *et seq.*) direct the Secretary of Commerce (as delegated to NMFS) to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region if certain findings are made and either regulations are issued or, if the taking is limited to harassment, a notice of a proposed incidental take authorization may be provided to the public for review.

Authorization for incidental takings shall be granted if NMFS finds that the taking will have a negligible impact on the species or stock(s) and will not have an unmitigable adverse impact on the availability of the species or stock(s) for taking for subsistence uses (where relevant). Further, NMFS must prescribe the permissible methods of taking and other “means of effecting the least practicable adverse impact” on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stocks for taking for certain subsistence uses (referred to in shorthand as “mitigation”); and requirements pertaining to the mitigation, monitoring and reporting of the takings are set forth. The definitions of all applicable MMPA statutory terms cited above are included in the relevant sections below.

### **Summary of Request**

On December 29, 2020, NMFS received a request from the National Science Foundation (NSF) for an IHA to take marine mammals incidental to pile driving activities associated with the construction of the Palmer Station Pier Replacement Project on Anvers Island, Antarctica. Hereafter (unless otherwise specified) the term “pile driving” is used to refer to both pile installation (including DTH pile installation) and pile removal. NSF submitted several revisions of the application until it was deemed

adequate and complete on July 15, 2021. NSF had requested, and NMFS has authorized, take of a small number of 17 species of marine mammals by Level B harassment and/or Level A harassment. Neither NSF nor NMFS expects serious injury or mortality to result from this activity, nor did NMFS authorize any. Therefore, an IHA is appropriate.

## **Description of Specified Activity**

### *Overview*

The purpose of the project is to construct a replacement pier at Palmer Station on Anvers Island, Antarctica for the United States Antarctic Program. It is severely deteriorated, and needs to be replaced as soon as possible. This project will include construction of a new steel pipe pile supported concrete deck pier, new modern energy absorbing fender system and on-site power and lighting. Construction of the replacement pier and removal of the existing pier will require down-the-hole (DTH) pile installation, vibratory hammer pile removal, vibratory hammer pile installation, limited impact driving to seat piles, rock chipping, and the use of a hydrogrinder. The planned project is expected to take up to 89 days of in-water work and will include the installation of 52 piles and removal of 36 piles. Due to a delay in schedule, in-water construction will now not begin until February 2, 2022 and will be completed no later than July 31, 2022. The **Federal Register** notification of the proposed IHA (86 FR 46199: August 18, 2021) stated that in-water construction would begin in October or November 2021, and would be completed by mid-April 2022. A detailed description of NSF's activities is provided in the **Federal Register** notification of the proposed IHA (86 FR 46199: August 18, 2021). The number of active construction days has not changed and no changes have been made to the planned construction activities. Therefore, a detailed description is not provided here. Please refer to that **Federal Register** notice for the description of the specific activity.

## **Comments and Responses**

A notice of NMFS' proposal to issue an IHA to NSF was published in the **Federal Register** on August 18, 2021 (86 FR 46199). That notice described, in detail, NSF's activity, the marine mammal species that may be affected by the activity, and the anticipated effects on marine mammals. During the 30-day public comment period, NMFS received comments from Ari Friedlaender Ph.D., Institute of Marine Sciences, University of California, Santa Cruz. A summary of the commenter's recommendations as well as NMFS' responses is below. Please see Dr. Friedlaender's letter for full details regarding their recommendations and rationale. The letter is available online at: <https://www.fisheries.noaa.gov/permit/incidental-take-authorizations-under-marine-mammal-protection-act>.

**Comment 1.** Dr. Friedlaender commented that several of the proposed take requests for marine mammals were based on inaccuracies and did not align with basic information on the distribution and abundance of animals around Palmer Station. He did not believe that the best available information was utilized. Dr. Friedlaender cited several research articles which were not contained in the **Federal Register** notification of the proposed IHA, which he felt could be useful in determining take of marine mammals.

**Response:** NMFS strives to identify and utilize the best available scientific information when evaluating potential impacts to marine mammals associated with actions described in submitted IHA applications. Dr. Friedlaender specifically identified papers by Felix *et al.* (2021), Johnston *et al.* (2012), and Jackson *et al.* (2006), as being relevant but were not included in the **Federal Register** notification of the proposed IHA.

Dr. Friedlaender commented that Felix *et al.* (2021) provided population estimates of 11,784 and 11,786 (up from 9,484 in the proposed IHA) for the breeding stock of humpback whales (breeding stock G) found in the vicinity of Palmer Station which constitutes about 90 percent of the humpback whale around the Antarctic Peninsula. Other stocks make up the remaining and are represented by approximately 10

percent of the Antarctic Peninsula abundance as presented by Reilly *et al.* (2004). This is considered to be the best available science and, therefore, NMFS has updated Table 1 and Table 17 in this notification of issuance to reflect the change.

NSF inadvertently omitted the paper by Johnston *et al.* (2012) from the application. Specifically, due to a word-processing formatting error the reference was not included in Table 6-3 of the application, although data from that source was used for the humpback whale group size estimate in the proposed IHA. The reference has been included in this notice. The density for humpback whales referenced in the Johnston *et al.* (2012) paper for Gerlach Strait in the area where Hero Inlet is located, is 0.09 whales/square kilometer ( $\text{km}^2$ ) while the density used in the proposed IHA was 0.03 whales/ $\text{km}^2$  (Santora *et al.*, 2009). Employing the density of 0.09 whales/ $\text{km}^2$  to estimate takes provides a new Level A harassment take estimate for humpback whales of 14.74 (previously 5.91) and a new Level B harassment take estimate of 302.18 (previously 121.21) for a total estimate of 317 takes.

After the public comment period ended on September 17, Dr. Friedlaender provided additional data to NMFS that was collected over a 5-year period at Palmer Station from January 4, 2015 through March 18, 2020 (Friedlaender, Personal Communication). Unless otherwise noted, personal communications from Friedlaender were either with NSF (which NSF then shared with NMFS) or with NMFS. The data was collected between January and March/April of each year from small boats, unmanned aerial systems (UASs) and land-based surveys. Ninety percent of the surveys (424 of 471) took place within the Palmer Station small boating limits which covers waters out to 2.5 mi (4 km) from the Station. A small number of surveys took place within the extended small boating limits which extend out to 25 mi (40 km) from the Station. Up to 3 surveys were conducted per day. A total of 671 humpback whales were sighted between January and March or April over 5 years, which is an average of 33.4 animals

per month. If it were assumed that the months of December and November also had the same average per month, then the total estimated take for the planned November-April work period would suggest 200 animals per year might be encountered in the area. However, to be precautionary, NMFS has used the Johnston *et al.* (2012) data to authorize 15 takes by Level A harassment and 302 takes by Level B harassment for a total of 317 authorized takes.

The paper by Jackson *et al.* (2006) does not provide abundance information on breeding stock G. Only breeding stocks E and F are included in this analysis. Therefore, it was not included as a reference for estimating humpback whale abundance near the Project Area.

NMFS will continue to use the best available scientific information, and we welcome future input from interested parties on data sources that may be of use in analyzing the potential presence and movement patterns of marine mammals potentially impacted by incidental take authorizations.

**Comment 2:** Dr. Friedlaender questioned the source of the marine mammal observation data supplied by NSF from Hero Inlet and nearby areas. He indicated that the data does not represent the known dedicated marine mammal surveys that have been conducted as part of NSF's Long Term Ecological Research (LTER) program since 2015 in this exact area. He feels that such information could have provided for a more accurate assessment of species abundance and occurrence patterns. He noted that these data would demonstrate that the densities of both Antarctic minke whales and fin whales are not significantly larger than those of humpback whales near Palmer Station as was described in the notification of proposed IHA. Therefore, proposed take for minke and fin whales should not be higher than for humpback whales.

**Response:** The LTER data provided by Friedlaender over five years and 369 days worth of effort showed sightings of 671 humpback whales, 54 Antarctic minke

whales, 5 killer whales, 1 southern right whale, zero blue whales, zero fin whales, 437 Antarctic fur seals, 22 leopard seals, 6 crabeater seals, 4 Weddell seals, and 2 southern elephant seals. Given this new information, NMFS agrees that estimates of takes for Antarctic minke whales (327) and fin whales (296) are likely overestimates of what may actually occur. The difference between is likely due to how available density estimates were appropriated. As part of the analysis in the proposed IHA if two density estimates (nearshore vs. offshore) for a marine mammal population are available, NMFS used the higher of two densities to be precautionary when estimating potential takes. As described in the notification of the proposed IHA, the nearshore density estimates for fin whales are significantly overestimated for Palmer Station as the density estimates come from surveys (Santora *et al.*, 2009) that occurred in depths that favored the nearshore distribution of fin whales in that specific area. It was also noted in the notification of the proposed IHA that fin whales have not been visually observed from Palmer Station during recent years. While approximately 5 Antarctic minke whale observations were recorded each year by Friedlaender, the higher offshore density was also used to estimate take for Antarctic minke whales. Friedlaender asserted that the proposed total takes of minke whales (327) and fin whales (296) should not be significantly higher than those of humpback whales (127). As noted in the previous comment, takes of humpback whales have been revised based on Johnston *et al.* (2021) data and are now (317) and authorized take of Antarctica minke whales (327) and fin whales (296) are no longer significantly higher. The takes that were proposed and are now authorized represent a precautionary approach to balance the estimated takes based solely on density and the observation data which recorded lower sightings.

In the absence of any additional data, NMFS has authorized take of minke whales and fin whales at the same levels that were determined in our preliminary findings in the **Federal Register** notification of the proposed IHA.

A student from Dr. Friedlaender's lab provided raw data regarding pinniped observations near Palmer station. The data was being used as part of the graduate student's thesis. However, the data only covered a January to March time period and observations were taken over an area larger area than the Level A or Level B harassment zones. Therefore, the data was not used.

**Comment 3:** Dr. Friedlaender commented that it was difficult to comprehend how the Level A and Level B harassment zones were calculated. He provided an example of how the area of a circle demarcated by the radius of the harassment zone isopleth should be split in half since the coast of Anvers Island precludes 180-degrees of land leaving 180-degrees of water ensonified.

**Response:** The estimated areas ( $\text{km}^2$ ) that would be ensonified above Level A and Level B harassment thresholds for each activity were calculated using the distances from Palmer Pier to the harassment thresholds for each species. The ensonified areas were determined by plotting these isopleths and using GIS to calculate the area within the polygons that would be above each threshold level. However, Palmer Pier is located in a narrow portion of Hero Inlet and the area potentially ensonified above Level A and Level B harassment thresholds is truncated by the proximity to land masses in the inlet (*i.e.*, shadow effect). In other words, acoustic propagation from the source would be impeded by natural features in the water, resulting in acoustic shadows behind such features. The areas of truncated land forms were subtracted from the combined circular land and water areas to calculate the in-water areas (*i.e.*, harassment zones) that are ensonified to Level A and Level B harassment thresholds. Therefore, no changes are necessary.

**Comment 4:** Dr. Friedlaender expressed concern that the required real-time monitoring methods seem inadequate and that animals occurring in a specified shutdown zone would not be detected. From personal experience in the region, he indicated that surveying the harassment zones from a single platform at Palmer Station, while likely to



allow for seeing large marine mammals, would result in pinnipeds and small cetaceans (e.g., minke whales) being missed by protected species observers (PSOs). He also suggested using unmanned aerial systems (UAS) and placing (PSOs) on nearby islands, in small boats.

**Response:** As part of the proposed IHA, NMFS considered some of Dr. Friedlaender's concerns about the efficacy of monitoring the large Level A and Level B harassment zones from a location at the lab behind the pier construction site and we specifically sought additional public input on this topic. Regarding the suggestion to employ UASs, NMFS asked NSF if this was possible. NSF indicated that operations in Antarctica are currently highly restricted due to COVID [protocols]. As Palmer Station will be staffed (at maximum capacity [in accordance to COVID protocols]) for construction only, rather than science operations, it will not have the usual services and staff available to support scientific operations (e.g., UAS operations, etc.). UAS operations in Antarctica are governed by the Antarctic Treaty and Protocol on Environmental Protection to the Antarctic Treaty, including domestic laws and regulations implementing its requirements, such as the Antarctic Conservation Act (ACA, 16 U.S.C. 2401 *et seq.*). Accordingly, the use of UAS requires experienced operators as well as an ACA waste permit (45 C.F.R. Part 671). Due to the limited staff capacity and thus lack of experienced operators, NSF did not obtain the necessary ACA waste permit. Given these circumstances, NMFS concurred with NSF's determination that this measure is not practicable. Regarding the placement of PSOs on islands in the vicinity of Palmer Station, due to life-safety and logistics issues, NSF has determined, and NMFS agrees, that it would not be practicable. Such an arrangement would require frequent small boat excursions each day, placing the boat operators and PSOs at risk. Given the extreme environment in Antarctica, weather can change drastically in minutes to an hour,

potentially leaving PSOs stranded on an island for extended periods and putting them at risk.

Furthermore, this will not be a typical year at Palmer Station due to the construction of the new pier and will not be staffed as during a normal year. Palmer Station will be staffed to support construction activities, not small boating operations. The current pier will be demolished in order to build the new one. The normal launch area for small boating operations will be in the construction zone and any launching of small boats would be extremely difficult and dangerous. NSF will also not have the staff capacity or expertise that would be necessary to transport PSOs to islands or run frequent small boat operations.

Due to the size of some of the larger harassment zones, NMFS acknowledges that the entirety of the shutdown zones in the proposed IHA may not be fully visible to PSOs, especially for smaller marine mammals. However, NMFS concurs with NSF that the suggested monitoring and mitigation measures suggested by Dr. Friedlaender to extend the detection range are not practicable at this time. Accordingly, NMFS has reduced the shutdown zones (as described in Tables 18 and 19) in all instances where the shutdown zones specified in the notification of proposed IHA were greater than 1,000 m. This will allow PSO's to monitor the shutdown zones with greater efficacy. Animals that are observed beyond 1,000-m zones during authorized activities will be recorded as having been potentially taken by Level A harassment if they are located within the specified Level A harassment zone for that species. NMFS will also require NSF to document any marine mammals observed within these Level A harassment zones, to the extent practicable (noting that some distances to these zones are too large to fully observe). Note that the take estimates provided in both the notification of proposed IHA and the final IHA were derived assuming that there was no monitoring or mitigation. Given the logistical and safety challenges present at Palmer Station, NSF believes that the required

monitoring measures will allow PSOs to adequately observe specified shutdown and harassment zones. NMFS agrees with this assessment.

### **Changes from the Proposed IHA to Final IHA**

Table 4 in the notification of proposed IHA incorrectly listed the humpback whale as being Endangered under the Endangered Species Act and Depleted under the Marine Mammal Protection Act. Those attributes have been removed as shown in Table 1 in this notice. The reference for the Johnston *et al.* (2012) paper on humpback whales was inadvertently omitted from Table 6-3 in the application, although data on humpback whale group size was actually included in that table. Based on the recommendation from Dr. Friedlaender to use density findings from Johnston *et al.*, (2012), NMFS has utilized the revised humpback whale density (0.09 animals/km<sup>2</sup>) resulting in increases of authorized take by both Level A and Level B harassment. These changes are described in more detail in the response to Comment 1. Recent humpback whale abundance data from Felix *et al.* (2021) was incorporated into this notice of issuance and is also described in detail in the response to Comment 1. Several of the species abundance estimates contained in Table 3 in the proposed IHA were incorrect. As such, abundance estimates for Antarctic minke whale, fin whale, and Southern elephant seal have been revised. Revisions to Antarctic minke whale and fin whale abundances were necessary since the estimates reported Reilly *et al.* (2004) in the proposed IHA (18,125 Antarctic minke whales and 4,672 fin whales) were based on a survey area that included both the Antarctic Peninsula and the Scotia Sea. The changes included in this notice (7,395 Antarctic minke whales and 1,492 fin whales) include data from only the Antarctic Peninsula survey area which is more representative of animal abundance near the Project Area. The abundance estimate published in the proposed IHA for Southern elephant seals (401,572) was incorrect. The actual abundance estimate is 413,671 according to Hindell *et al.* (2016).

NMFS had incorrectly listed only one proposed take of leopard seal by Level B harassment in Table 20 of the **Federal Register** notification of proposed IHA. The text clearly indicates that NMFS was proposing five takes by Level B harassment, in addition to the five authorized takes by Level A harassment. However, as described below authorized take of leopard seals has been increased above those presented in the notification of proposed IHA. These updates are based on the new in-water project schedule starting on February 2, 2022 and extending to July 31, 2022. The original schedule contained in the notification of proposed IHA had the project running from October/November through April. Also, the observational data submitted to NMFS that was used to develop pinniped take estimates was found to contain errors. NMFS requested that NSF submit the correct data and reassessed the pinniped take estimates for this notice. Revisions are described in the detail in the section *Marine Mammal Occurrence and Take Estimation*.

In cases where species' abundance estimates have changed the corresponding percentage of stock potentially affected has also been revised. Species where the percentages changed include humpback whale (from 1.34 to 2.69), Antarctic minke whale (from 1.80 to 4.42), and fin whale (from 6.33 to 19.84). Take revisions based on a reassessment of the corrected pinniped observational data resulted in increases in percentage of stock potentially taken for Southern elephant seals (from <0.01 to 0.23), Antarctic fur seals (0.02 to 0.05), Weddell seals (from 0.04 to 0.05), and Leopard seals (from <0.01 to 0.06). These revisions are included in Table 17 of this notice. Finally, NMFS will now require the implementation and monitoring of a 1,000-m shutdown zone in every instance where the specified shutdown zone for a hearing group for a given activity was originally proposed to be greater than 1,000 m.

### **Description of Marine Mammals in the Area of Specified Activities**

There are 17 species in the Project Area for which NMFS has authorized take. Sections 3 and 4 of NSF's application summarize available information regarding status and trends, distribution and habitat preferences, and behavior and life history of the potentially affected species. Additional information regarding population trends and threats may be found in NMFS' Stock Assessment Reports (SARs; <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessments>), and more general information about these species (e.g., physical and behavioral descriptions) may be found on NMFS's website (<https://www.fisheries.noaa.gov/find-species>).

Table 1 lists all species or stocks for which take has been authorized, and summarizes best available information on the population or stock, including regulatory status under the MMPA and Endangered Species Act. For taxonomy, we follow Committee on Taxonomy (2020). Marine mammals in the Project Area do not constitute stocks under U.S. jurisdiction; therefore, there are no stock assessment reports. Additional information on these species may be found in Section 3 of NSF's application.

For species occurring near the Antarctic Peninsula the International Union for the Conservation of Nature (IUCN) status is provided. The IUCN systematically assesses the relative risk of extinction for terrestrial and aquatic plant and animal species via a classification scheme using five designations, including three threatened categories (Critically Endangered, Endangered, and Vulnerable) and two non-threatened categories (Near Threatened and Least Concern) ([www.iucnredlist.org/](http://www.iucnredlist.org/); accessed June 10, 2021). These assessments are generally made relative to the species' global status, and therefore may have limited applicability when marine mammal stocks are defined because we analyze the potential population-level effects of the specified activity to the relevant stock. However, where stocks are not defined, IUCN status can provide a useful reference.

**Table 1. Marine Mammals Potentially Present in the Vicinity of the Project Area**

Common name	Scientific name	Stock <sup>2</sup>	ESA/MMPA/IUC N status <sup>3</sup>	Abundance (CV) <sup>4</sup>
Order Cetartiodactyla – Cetacea – Superfamily Mysticeti (baleen whales)				
Family Balaenidae (right whales)				
Southern right whale	<i>Eubalaena australis</i>		E/D/LC	1,755 (0.62) <sup>5</sup>
Family Balaenopteridae (rorquals)				
Humpback whale	<i>Megaptera novaeangliae australis</i>		-/LC	12,486 <sup>15</sup>
Antarctic minke whale	<i>Balaenoptera bonaerensis</i>		-/NT	7,395 (0.36) <sup>5</sup>
Fin whale	<i>B. physalus quoyi</i>		E/D/VU	1,492 (0.57) <sup>5</sup>
Blue whale	<i>B. musculus musculus</i>		E/D/EN	1,700 <sup>13</sup>
Sei whale	<i>Balaenoptera borealis</i>		E/D/EN	626 <sup>14</sup>
Superfamily Odontoceti (toothed whales, dolphins, and porpoises)				
Family Physeteridae				
Sperm whale	<i>Physeter macrocephalus</i>		E/D/VU	12,069 (0.17) <sup>7</sup>
Family Ziphiidae (beaked whales)				
Arnoux's beaked whale	<i>Berardius arnuxii</i>		/DD	unknown
Southern bottlenose whale	<i>Hyperoodon planifrons</i>		-/LC	53,743 (0.12) <sup>8</sup>
Family Delphinidae				
Hourglass dolphin	<i>Lagenorhynchus cruciger</i>		-/LC	144,300 (0.17) <sup>9</sup>
Killer whale	<i>Orcinus orca</i> <sup>1</sup>		-/DD	24,790 (0.23) <sup>8</sup>
Long-finned pilot whale	<i>Globicephala melas edwardii</i>		-/LC	200,000 (0.35) <sup>9</sup>
Order Carnivora – Superfamily Pinnipedia				
Family Otariidae (eared seals and sea lions)				
Antarctic fur seal	<i>Arctocephalus gazella</i>	South Georgia	-/LC	2,700,000 <sup>10</sup>
Family Phocidae (earless seals)				

Southern elephant seal	<i>Mirounga leonina</i>	South Georgia	-/LC	413,671 <sup>11</sup>
Weddell seal	<i>Leptonychotes weddellii</i>		-/LC	500,000-1,000,000 <sup>12</sup>
Crabeater seal	<i>Lobodon carcinophaga</i>		-/LC	5,000,000-10,000,000 <sup>12</sup>
Leopard seal	<i>Hydrurga leptonyx</i>		-/LC	222,000-440,000 <sup>12</sup>

<sup>1</sup>Three distinct forms of killer whale have been described from Antarctic waters; referred to as types A, B, and C, they are purported prey specialists on Antarctic minke whales, seals, and fish, respectively (Pitman and Ensor, 2003; Pitman *et al.*, 2010).

<sup>2</sup>For most species in the AMLR, stocks are not delineated and entries refer generally to individuals of the species occurring in the research area.

<sup>3</sup>Endangered Species Act (ESA) status: Endangered (E), Threatened (T)/MMPA status: Depleted (D). A dash (-) indicates that the species is not listed under the ESA or designated as depleted under the MMPA. Any species listed under the ESA is automatically designated under the MMPA as depleted. IUCN status: Endangered (EN), Vulnerable (VU), Near Threatened (NT), Least Concern (LC), Data Deficient (DD).

<sup>4</sup>CV is coefficient of variation. All abundance estimates, except for those from Reilly *et al.*, (2004) (right, humpback, minke, and fin whales), are for entire Southern Ocean (*i.e.*, waters south of 60°S) and not the smaller area comprising the Southwest Fisheries Science Center (SWFSC) research area.

<sup>5</sup>Abundance estimates reported in Reilly *et al.*, (2004) for the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) survey area from 2000. This value has been revised to include abundance in only the Antarctic Peninsula and excluded the Scotia Sea as part of the Survey Area which was shown in the proposed IHA.

<sup>6</sup>Southern Ocean abundance estimate (Branch *et al.*, 2007).

<sup>7</sup>Southern Ocean abundance estimate (IWC, 2001 in Whitehead, 2002).

<sup>8</sup>Southern Ocean abundance estimate from circumpolar surveys covering 68 percent of waters south of 60°S from 1991-98 (Branch and Butterworth, 2001).

<sup>9</sup>Southern Ocean abundance estimate derived from surveys conducted from 1976-88 (Kasamatsu and Joyce, 1995).

<sup>10</sup>South Georgia abundance estimate; likely >95 percent of range-wide abundance (Forcada and Staniland, 2009).

Genetic evidence shows two distinct population regions, likely descended from surviving post-sealing populations at South Georgia, Bouvetøya, and Kerguelen Islands (Wynen *et al.*, 2000; Forcada and Staniland, 2009). Individuals from the South Georgia population (including breeding populations at the South Orkney and South Shetland Islands, which are within the ARA) are likely to occur in the ARA.

<sup>11</sup> The abundance figure provided in the proposed IHA was incorrect. The correct abundance is included in this Table (Hindell *et al.*, 2016);

<sup>12</sup>Range-wide abundance estimates (Thomas and Terhune, 2009; Bengtson, 2009; Rogers, 2009).

<sup>13</sup> Southern Ocean abundance estimate (Branch *et al.*, 2007).

<sup>14</sup> South of 60°S from NOAA (2015).

<sup>15</sup> Felix *et al.*, 2021. Population estimate for the humpback whale Breeding Stock G (BSG), defined by feeding grounds around the Antarctic Peninsula. Approximately 90% of humpback whales in Antarctic Peninsula are from BSG (Friedlaender, Personal Communication). Approximately 10% of Antarctic Peninsula abundance from Reilly *et al.* (2004) represents remaining.

A detailed description of the species likely to be affected by the pile driving activities, including brief introductions to the species and relevant stocks as well as available information regarding population trends and threats, and information regarding local occurrence, were provided in the notice for the proposed IHA. Since that time, we are not aware of any changes in the status of these species and stocks. As noted previously, the term “pile driving” (unless otherwise specified) is used to refer to both pile installation (including DTH pile installation) and pile removal.

Therefore, detailed descriptions are not provided here. Please refer to that **Federal Register** notice for these descriptions.

### **Potential Effects of Specified Activities on Marine Mammals and Their Habitat**

The **Federal Register** notification of the proposed IHA (86 FR 46199; August 18, 2021) included a discussion of the effects of anthropogenic noise on marine mammals and the potential effects of underwater noise from NSF's specified activities on marine mammals and their habitat. That information and analysis is incorporated by reference into this final IHA determination and is not repeated here; please refer to the proposed IHA. No new data is available that suggests the potential responses and impacts to marine mammals would differ from those discussed in the notification of the proposed IHA.

### **Estimated Take**

This section provides an estimate of the number of incidental takes authorized through this IHA, which will inform both NMFS' consideration of "small numbers" and the negligible impact determination. As noted above, some take estimates have changed since the proposed IHA, and those changes are described in the *Marine Mammal Occurrence and Take Estimation* section below.

Harassment is the only type of take expected to result from these activities. Except with respect to certain activities not pertinent here, section 3(18) of the MMPA defines "harassment" as any act of pursuit, torment, or annoyance, which (i) has the potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment); or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering (Level B harassment).

Authorized takes will primarily be by Level B harassment, as use of the acoustic sources (*i.e.*, pile installation and removal equipment) has the potential to result in disruption of behavioral patterns for individual marine mammals. There is also some



potential for auditory injury (Level A harassment) to result, primarily for mysticetes due to large PTS zones as well as for phocids and otariids due to haulouts in the vicinity of the Project Area. Auditory injury is unlikely to occur for high frequency or mid-frequency species. The required mitigation and monitoring measures are expected to minimize the severity of the taking to the extent practicable.

As described previously, no mortality or serious injury is anticipated or authorized for this activity. Below we describe how the take is estimated.

Generally speaking, we estimate take by considering: (1) acoustic thresholds above which NMFS believes the best available science indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; (2) the area or volume of water that will be ensonified above these levels in a day; (3) the density or occurrence of marine mammals within these ensonified areas; and (4) the number of days of activities. We note that while these factors can contribute to a basic calculation to provide an initial prediction of takes, additional information that can qualitatively inform take estimates is also sometimes available (*e.g.*, previous monitoring results or average group size). Below, we describe the factors considered here in more detail and present the authorized take estimate.

#### *Acoustic Thresholds*

NMFS recommends the use of acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

*Level B Harassment for non-explosive sources* – Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals

(hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall *et al.*, 2007, Ellison *et al.*, 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1  $\mu$ Pa (rms) for continuous (*e.g.*, vibratory pile-driving, DTH) and above 160 dB re 1  $\mu$ Pa (rms) for non-explosive impulsive (*e.g.*, seismic airguns, impact pile driving) or intermittent (*e.g.*, scientific sonar) sources.

DTH pile installation includes drilling (non-impulsive sound) and hammering (impulsive sound) to penetrate rocky substrates (Denes *et al.*, 2016; Denes *et al.*, 2019; Reyff and Heyvaert 2019). DTH pile installation was initially thought to be a primarily non-impulsive noise source. However, Denes *et al.*, (2019) concluded from a study conducted in Virginia, that DTH pile installation should also be characterized as impulsive based on Southall *et al.*, (2007), who stated that signals with a >3 dB difference in sound pressure level in a 0.035-second window compared to a 1-second window can be considered impulsive. Therefore, DTH pile installation is treated as both an impulsive and non-impulsive noise source. In order to evaluate Level A harassment, DTH pile installation activities are evaluated according to the impulsive criteria and using 160 dB rms. Level B harassment isopleths for DTH are determined by applying non-impulsive criteria and using the 120 dB rms threshold which is also used for vibratory driving. This approach ensures that the largest ranges to effect for both Level A and Level B harassment are accounted for in the take estimation process for DTH.

NSF’s planned activity includes the use of continuous (vibratory hammer, DTH pile installation, hydrogrinder) and impulsive (impact pile driving, DTH pile installation) sources, and therefore the 120 and 160 dB re 1 µPa (rms) is/are applicable.

*Level A harassment for non-explosive sources* - NMFS’ Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0) (Technical Guidance, 2018) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups (based on hearing sensitivity) as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). NSF’s planned activity includes the use of impulsive (*i.e.* impact hammer, DTH pile installation) and non-impulsive (*i.e.*, vibratory hammer, DTH pile installation, rock chipping, hydrogrinder) sources.

These thresholds are provided in Table 2. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance>.

**Table 2. Thresholds Identifying the Onset of Permanent Threshold Shift**

	PTS Onset Acoustic Thresholds* (Received Level)	
Hearing Group	Impulsive	Non-impulsive
Low-Frequency (LF) Cetaceans	<i>Cell 1</i> $L_{pk,flat}$ : 219 dB $L_{E,LF,24h}$ : 183 dB	<i>Cell 2</i> $L_{E,LF,24h}$ : 199 dB
Mid-Frequency (MF) Cetaceans	<i>Cell 3</i> $L_{pk,flat}$ : 230 dB $L_{E,MF,24h}$ : 185 dB	<i>Cell 4</i> $L_{E,MF,24h}$ : 198 dB
High-Frequency (HF) Cetaceans	<i>Cell 5</i> $L_{pk,flat}$ : 202 dB $L_{E,HF,24h}$ : 155 dB	<i>Cell 6</i> $L_{E,HF,24h}$ : 173 dB
Phocid Pinnipeds (PW) (Underwater)	<i>Cell 7</i> $L_{pk,flat}$ : 218 dB $L_{E,PW,24h}$ : 185 dB	<i>Cell 8</i> $L_{E,PW,24h}$ : 201 dB
Otariid Pinnipeds (OW) (Underwater)	<i>Cell 9</i> $L_{pk,flat}$ : 232 dB	<i>Cell 10</i> $L_{E,OW,24h}$ : 219 dB

	$L_{E,OW,24h}$ : 203 dB	
<p>* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.</p> <p><u>Note:</u> Peak sound pressure (<math>L_{pk}</math>) has a reference value of 1 <math>\mu</math>Pa, and cumulative sound exposure level (<math>L_E</math>) has a reference value of 1 <math>\mu</math>Pa<sup>2</sup>s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript “flat” is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (<i>i.e.</i>, varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.</p>		

### *Ensonified Area*

Here, we describe operational and environmental parameters of the activity that will feed into identifying the area ensonified above the acoustic thresholds, which include source levels and transmission loss coefficient.

The sound field in the Project Area is the existing background noise plus additional in-water construction noise from the planned project. Marine mammals are expected to be affected via sound generated by the primary components of the project (*i.e.*, DTH pile installation, vibratory pile removal, limited impact for proofing purpose, rock chipping and use of hydrogrinders).

The estimated sound source levels (SSL) proposed by NSF and utilized by NMFS in this assessment are described below and are shown in Table 3. Appendix A in the application discusses in detail the sound source levels for all planned equipment. Sound levels from pile installation used in NSF’s application came from the Caltrans Compendium (2015) or are based on empirical data collected from other sites with similar conditions (*e.g.*, rock substrate where DTH driving would be used to install piles). NSF referenced two studies to arrive at SSLs for 24-in DTH pile installation. Noise studies from Kodiak ferry terminal (Denes *et al.*, 2016) and Skagway cruise ship terminal (Reyff and Heyvart, 2019; Reyff, 2020). Results are shown in Table 3. NMFS has

developed DTH pile installation guidelines which contain recommendations for appropriate SSLs. NSF applied these recommendations for 36-in DTH pile installation. However, NSF proposed to use the DTH pile installation SSLs shown in Table 3, which, for 24-in DTH pile installation and 24-in sockets, are more conservative than those recommended by NMFS, and NMFS deemed this approach acceptable.

NSF determined the SSLs for rock chipping based on underwater sounds measured for concrete demolition. NSF examined two sets of data available during the demolition of the Tappan Zee Bridge (state of New York) pier structures. NSF also considered the results from another study conducted by the Washington State Department of Transportation (WSDOT). Results from that analysis are shown in Table 3.

The U.S. Navy has assessed sound levels of the use of a hydrogrinder through underwater measurements (U.S. Navy 2018). The Navy measurements were reported in 1/1-octave frequency bands from 125 to 8,000 Hz for the helmet position that was assumed to be 0.5 to 1 meter (m) from the hydraulic grinder operation. The overall unweighted sound level was computed to be 167.5 dB at 0.5 to 1 m. Source sound levels in this report are provided for 10-m distances. Since this is a point source of sound, spherical spreading  $20 \log TL$  coefficient results in a source sound level of 142 to 148 dB at 10 m (see Appendix A in the application). A value of 146 dB at 10 m has been used to estimate marine mammal take associated with these tools.

NSF assumed that installation of approximately one to two piles would occur over a 12-hour work day. To be precautionary in calculating isopleths, this application assumes two installation activities would occur simultaneously. For example, two 36-in piles installed simultaneously or one 36-in pile and one 24-in pile. Brief impact pile driving of about 10 strikes may be used to seat the piles. A likely approach to installing 36-in piles would be to use DTH to install two 36-in piles simultaneously; one 36-in pile would be installed to 20-ft socket depth while a second 36-in abutment pile would be

installed to a 30-ft socket depth. The abutment piles require additional depth to support lateral loads and to provide side friction against ice uplift that could occur at the shoreline. It is also possible that both 36-in piles may be installed simultaneously to 20-ft socket.

Rock chipping may be required to level pile areas and would normally occur on the same day as DTH pile installation, if possible. If rock chipping is conducted separately from DTH pile installation, takes are accounted for by using the area ensonified during DTH pile installation to calculate takes. This precautionary approach overestimates takes that could occur if only rock chipping is conducted by itself. Rock chipping is considered to be an impulsive source.

Existing sheetpile will be removed through vibratory extraction. In some instances it may be necessary to remove piles by cutting them off at the mudline using underwater hand cutting tools. Such activity would occur on the same days as vibratory extraction. Cutting piles off at the mudline would result in less underwater noise than vibratory removal. To be precautionary, estimated marine mammal takes were calculated by assuming all piles were removed by vibratory extraction.

**Table 3. Sound Source Levels**

Measured Sound Levels <sup>1</sup>					Source
Activity	Peak	RMS	SEL <sup>2</sup>	TL	
24-in Piles					
DTH pile installation	190	166	154	15	Denes <i>et al.</i> , (2016)
Vibratory Driving <sup>4</sup>	170	165	165	15	Caltrans (2015)
Impact Driving	195	181	168	15	Caltrans (2015)
36-in Piles					
DTH pile installation	194	166	164	15	The DTH sound source proxy of 164 dB SEL is from 42-in piles, Reyff (2020) and Denes <i>et al.</i> , (2019)

Vibratory Driving	180	170	170	15	Caltrans (2015)
Impact Driving	210	193	183	15	Caltrans (2015)
H Piles inserted in 24-in. Sockets					
DTH pile installation	190	166	154	15	Denes <i>et al.</i> , (2016)
Vibratory Driving	170	165	165	15	Caltrans (2015)
Impact Driving	195	180	170	15	Caltrans (2015)
Removal of 24-in Template Piles					
Vibratory Driving	170	165	165	15	Caltrans (2015)
Removal of Sheet Piles					
Vibratory Driving	175	160	160	15	Caltrans (2015)
Rock Chipping					
Hydraulic Breaker	197	184	175	22	Tappan Zee Bridge <sup>6,7</sup>
Anode Installation					
Hydro-grinder		146		20	U.S. Navy (2008)

<sup>1</sup>See Appendix A in application for references and discussion of all sound sources.

<sup>2</sup>SEL is single strike for impact driving and DTH pile installation. SEL for vibratory installation is per second.

<sup>4</sup>Includes removal of 24-in. piles

<sup>5</sup>While it is possible the socket depth would be only 20 ft, this application assumes the greater depth to be precautionary.

<sup>6</sup>Reyff, J. 2018. Demolition of Existing Tappan Zee Bridge. Summary of Underwater Sound Measurements for Mechanical Demolition of Concrete Pile Caps at Piers 114 and 115, Circular Caisson at Pier 166, and Rectangular Caisson at Pier 170. To David Capobianco, New York State Thruway Authority. December 18, 2020.

<sup>7</sup>Reyff, J. 2018. Demolition of Existing Tappan Zee Bridge Subject: Summary of Underwater Sound Measurements for Mechanical Demolition of Ice Breakers at Piers 173 and 169. To Kristine Edwards, New York State Thruway Authority. January 10, 2018.

When the sound fields from two or more concurrent pile installation activities overlap, the decibel addition of continuous noise sources results in much larger zone sizes than a single source. Decibel addition is not a consideration when sound fields do not overlap. The increased SLs potentially associated with two concurrent sources with

overlapping sound fields are shown in Table 4 (WSDOT 2015). Decibel addition is only applicable to continuous sources. According to NMFS guidance the SL for continuous sounds from DTH pile installation is 166 dB regardless of the size of the pile. Under decibel addition, simultaneous DTH pile installation activities would use a SL of 169 (166 + 3) to derive the isopleth for the Level B harassment zone.

**Table 4. Simultaneous Source Decibel Addition**

Hammer Types	Difference in SSL	Level A Harassment Zones	Level B Harassment Zones
Vibratory, Impact	Any	Use impact zones	Use largest zone
Impact, Impact	Any	Use zones for each pile size and number of strikes	Use zone for each pile size
Vibratory, Vibratory	0 or 1 dB	Add 3 dB to the higher source level	Add 3 dB to the higher source level
	2 or 3 dB	Add 2 dB to the higher source level	Add 2 dB to the higher source level
	4 to 9 dB	Add 1 dB to the higher source level	Add 1 dB to the higher source level
	10 dB or more	Add 0 dB to the higher source level	Add 0 dB to the higher source level

#### *Level B Harassment Zones*

Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

$$TL = B * \text{Log}_{10} (R1/R2), \text{ where}$$

TL = transmission loss in dB

B = transmission loss coefficient; for practical spreading equals 15



R1 = the distance of the modeled SPL from the driven pile, and

R2 = the distance from the driven pile of the initial measurement

The recommended TL coefficient for most nearshore environments is the practical spreading value of 15. This value results in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions, which is the most appropriate assumption for NSF's planned activity in the absence of specific modelling. Level B harassment isopleths are shown in Table 11 and Table 12.

#### *Level A Harassment Zones*

When the NMFS Technical Guidance (2016) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, we developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. We note that because of some of the assumptions included in the methods used for these tools, we anticipate that isopleths produced are typically going to be overestimates of some degree, which may result in some degree of overestimate of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available, and NMFS continues to develop ways to quantitatively refine these tools, and will qualitatively address the output where appropriate. For stationary sources such as those planned for this project, NMFS User Spreadsheet predicts the distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would incur PTS. Inputs used in the User Spreadsheet, and the resulting isopleths are reported below. Tables 7, 8 and 9 show User inputs for single sound sources while Tables 10, 11, and 12 contain User inputs for simultaneous sources. The resulting Level A harassment isopleths for non-simultaneous activities and simultaneous activities are shown in Table 11 and Table 12 respectively. Level B harassment isopleths for

simultaneous DTH pile installation utilize a 169 dB SL and corresponding isopleths are shown in Table 12. Note that strike numbers for DTH pile installation were derived by applying the duration required to drive a single pile (minutes), the number of piles driven per day, and the strike rate (average strikes per second) rates to arrive at the total number of strikes in a 24-hour period. A rate of 10 strikes per second was assumed.

**Table 5. NMFS Technical Guidance (2020) User Spreadsheet Inputs To Calculate PTS Isopleths for Non-Simultaneous Vibratory Pile Installation Activities and Hydrogrinding**

	36-in (Dock Dock Abutment)-in	RHIB Fender Piles 24-in	24-in template 10' socket)	24-in wave attenuator piles- in	24-in Template pile removal	Sheet Pile Removal	Anode installation (hydro-grinding)
Spreadsheet Tab Used	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.	A.1) Non-Impul, Stat, Cont.
Source Level (SPL RMS)	170	165	165	165	165	160	146
15Transmission Loss Coefficient	15	15	15	15	15	15	20
Weighting Factor Adjustment (kHz)	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Time to install / remove single pile (minutes)	30	30	30	30	30	30	120
Piles to install / remove per day	1	1	2	1	16	16	1

**Table 6. NMFS Technical Guidance (2020) User Spreadsheet Input To Calculate PTS Isopleths for Non-Simultaneous Impact Pile Installation Activities**

	36-in (Dock, Dock Abutment)	24-in RHIB, (template, wave attenuator)	Rock Chipping
Spreadsheet Tab Used	E.1) Impact pile driving	E.1) Impact pile driving	E) Stationary Source: Impulsive, Intermittent
Source Level (Single Strike/shot SEL)	183	168	197
Transmission Loss Coefficient	15	15	22
Weighting Factor Adjustment (kHz)	2	2	0
Number of pulses in 1-hr period	10	10	2,700
Piles per day	1	1	

**Table 7. NMFS Technical Guidance (2020) User Spreadsheet Input To Calculate PTS Isopleths for Non-Simultaneous DTH Pile Installation Activities**

	36-in Dock 20' socket	Dock Abutment-36-in 30' socket	24-in RHIB, template, wave attenuator
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Spreadsheet Tab Used	E.2) DTH Pile Driving	E.2) DTH Pile Driving	E.2) DTH Pile Driving
Source Level (Single Strike/Shot SEL)	164	164	154
Transmission Loss Coefficient	15	15	15
Strike rate ( Strikes/sec)	10	10	10
Duration (min)	345	518	345
Weighting Factor Adjustment (kHz)	2	2	2
Strikes/pile	207,000	310,500	207,000
Piles to install / remove per day	1	1	1

**Table 8. NMFS Technical Guidance (2020) User Spreadsheet Input To Calculate PTS Isopleths for Simultaneous Vibratory Pile Installation Activities**

	36-in Dock 20' socket x 2 Dock Abutment	RHIB Fender Piles 24- in x 2	24-in template 10'socket x 4	24-in wave attenuator piles- 10'socket x 2	24-in wave attenuator piles- 20'socket x 2
Spreadsheet Tab Used	A.1) Non-Impul, Stat, Cont.	A.1) Non- Impul, Stat, Cont.	A.1) Non- Impul, Stat, Cont.	A.1) Non- Impul, Stat, Cont.	A.1) Non- Impul, Stat, Cont.
Source Level (SPL RMS)	173	168	168	168	168
Transmission Loss Coefficient	15	15	15	15	15
Weighting Factor Adjustment (kHz)	2.5	2.5	2.5	2.5	2.5
Time to install / remove single pile (minutes)	30	30	15	30	30
Piles to install / remove per day	2	2	4	2	2

**Table 9—NMFS Technical Guidance (2020) User Spreadsheet Input To Calculate PTS Isopleths for Simultaneous Impact Pile Installation Activities**

	36-in (Dock 20' socket x 2) or Dock Abutment-36-in	RHIB Fender	24-in template	24-in wave attenuator piles x 2
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	30' and 20' socket	Piles 24-in x 2	10'socket x 4	
Spreadsheet Tab Used	E.1) Impact pile driving	E.1) Impact pile driving	E.1) Impact pile driving	E.1) Impact pile driving
Source Level (Single Strike/shot SEL)	183	168	168	168
Transmission Loss Coefficient	15	15	15	15
Weighting Factor Adjustment (kHz)	2	2	2	2
Strikes/pile	10	10	10	10
Piles per day	2	2	4	2

**Table 10—NMFS Technical Guidance (2020) User Spreadsheet Input To Calculate PTS Isopleths for Simultaneous DTH Pile Installation Activities**

	36-in Dock 20' socket x 2	Dock Abutment- 36-in 30' and 20' socket	24-in template 10'socket x 4	24-in wave attenuator piles- 10'socket x 2/ RHIB Fender Piles 24-in x 2
Spreadsheet Tab Used	E.2) DTH Pile Driving	E.2) DTH Pile Driving	E.2) DTH Pile Driving	E.2) DTH Pile Driving
Source Level (Single Strike/Shot SEL)	164	164	154	154
Transmission Loss Coefficient	15	15	15	15
Strike rate (Strikes/sec)	10	10	10	10
Duration (min)	345	430	172.5	345
Weighting Factor Adjustment (kHz)	2	2	2	2
Strikes/pile	414,000	517,500	103,500	207,000
Piles to install per day	2	2	4	2

**Table 11 —Level A and Level B Harassment Isopleths for Non-Simultaneous Pile Installation Activities**

		Level A Harassment Zones (m) Based on SELcum					Level B Harassment Zone (m)
		Cetaceans			Pinnipeds		
		LF	MF	HF	PW	OW	
Dock, 36-in Dia. Pile Installation, 20’ Socket Depth - 1 pile/day	DTH Pile Drilling	1,891	67	2,253	1,012	74	11,659
Dock Abutment, 36-in Dia. Pile Installation, 30’ Socket Depth - 1 pile/day	DTH Pile Drilling	2,478	88	2,951	1,326	97	11,659
RHIB Fender Piles, 24-in Dia. Pile Installation, 20’ Socket - 1 pile/day	DTH Pile Drilling	407	15	485	218	16	11,659
24-in Dia. Template Piles, 10’ Socket Depth - 2 piles/day	DTH Pile Drilling	407	15	485	218	16	11,659
24-in Dia. Wave Attenuator Piles, 20’ Socket Depth - 1 pile/day	DTH Pile Drilling	407	15	485	218	16	11,659
Retaining Wall HP Pile inserted in Drilled 24-in Dia .Sockets, 20’ Socket Depth - 1 pile/day	DTH Pile Drilling	407	15	485	218	16	11,659m
Removal of 24-in Dia. Template Piles - 16 piles	Vibratory	51	5	75	31	2	10,000
Removal of Sheet Piles	Vibratory	23	2	35	14	1	4,642
Rock Chipping/Floor Preparation	Hydraulic Breaker	403	50	716	204	29	123
Anode Installation	Hydrogrinder	1.9	0.3	2.5	1.3	0.2	200

**Table 12 —Level A and Level B Harassment Isopleths for Simultaneous Pile Installation Activities**

Daily Activity Scenario	Installation Method	Level A Harassment Zones (m) Based on SELcum					Level B Harassment Zone (m)
		Cetaceans			Pinnipeds		
		LF	MF	HF	PW	OW	
Dock, 36-in Dia. Pile Installation, 20’ Socket Depth - 2 pile/day	DTH Pile Installation	3,002	107	3,576	1,607	117	18,478
Dock Abutment, 36-in Dia. Pile Installation, 30’ Socket Depth and 36-in Dia. Pile 20’ Socket Depth		3,484	124	4,149	1,864	136	18,478
RHIB Fender Piles, 24-in Dia. Pile Installation, 20’ Socket - 2 pile/day		647	23	770	346	25	18,478
24-in Dia. Template Piles, 10’ Socket Depth - 4 piles/day							
24-in Dia. Wave Attenuator Piles, 20’ Socket Depth - 2 pile/day							
Retaining Wall - HP Pile inserted in Drilled 24-in Dia. Sockets, 20’ Socket Depth - 2 piles/day		2,011	72	2,395	1,076	78	18,478
Dock, 36-in Dia. Pile Installation, 20’ Socket Depth - 1 pile/day and Wave Attenuator, 24-in Dia. Pile Installation, 20’ Socket - 1 pile/day							
Dock 36-in Dia. Pile Installation 30’ Socket Depth and 24-in Dia. Pile Installation 20’ Socket Depth		2,885	103	3,436	1,544	133	18,478
36-in Dock 20’ socket x 2 Dock Abutment	Vibratory Installation	43	4	64	26	2	34,146
RHIB Fender Piles 24-in x 2		20	2	30	12	1	15,849

24-in template 10'socket x 4							
24-in wave attenuator piles- 10'socket x 2							
24-in wave attenuator piles- 20'socket x 2		31.8	3	47	19	1.4	



The calculated area ensonified by single or multiple pile installation and removal sound sources is calculated based on the distance from the Palmer Station Pier installation location to the edge of the isopleth for Level B harassment and for each hearing group for Level A harassment. The scenario with the largest zone is used to estimate potential marine mammal exposures and those areas are shown in Table 13. The Palmer Station Pier is located in a narrow portion of Hero Inlet and the areas potentially ensonified above Level A and Level B harassment thresholds is truncated by the location of land masses including assorted islands (*i.e.*, shadow effect).

Table 12 shows the construction scenario (installation of two 36-in piles, one at 30- ft and a second at 20-ft socket depth) that results in the largest PTS zone isopleths while Table 13 shows the areas of the corresponding zones ensonified areas. The maximum Level A harassment distance would be 1,864 m (1.4 km<sup>2</sup>) for phocids in water (PW), 3,484 m (3.38 km<sup>2</sup>) for LF cetaceans, and 4,149 m (4.4 km<sup>2</sup>) for HF cetaceans (although HF cetaceans are considered rare in the Project Area and Level A harassment takes are not authorized). The largest Level B harassment isopleth is associated with simultaneous DTH pile installation and would be at a distance of 18,478 m from the source covering an area of 54.99 m.

**Table 13. Harassment Zone Areas Used for Take Estimation <sup>1</sup>**

Pile Type	Total Piles	Level A Max Area Cetaceans <sup>3</sup> (km <sup>2</sup> )	Level A Max Area Pinnipeds <sup>3</sup> (km <sup>2</sup> )	Level B Area All Species (km <sup>2</sup> )
36-in piles (one @30-ft socket depth and one @20-ft socket depth)	18	3.38 (LF) 4.4 (HF) 0.03 (MF)	1.4 (PW) 0.03 (OW)	54.99
32-in piles (Bent 1)	4			
Pile Removal (24-in)	16	0.006 (LF) 0.012 (MF) ~0 (MF)	0.002 (PW)	20.78
Sheetpile Removal	20	0.001 (LF) 0.003 (HF) ~0 (MF)	0.0006 (PW)	5.27
Anode Installation	n/a	n/a	n/a	0.07
Rock Chipping	unk			
Total	88			

<sup>1</sup>Assumes simultaneous installation (*i.e.*, two pile installations occurring at the same time).

## *Marine Mammal Occurrence and Take Estimation*

In this section we provide the information about the presence, density, or group dynamics of marine mammals that have informed the take calculations.

The approach by which the information provided above is brought together to produce a quantitative take estimate is described here. For marine mammals with known density information estimated harassment take numbers are calculated using the following equation (summed across each type of activity):

$$\text{Estimated take} = \text{animal density} \times \text{ensonified area} \times \text{operating days}$$

For some species observational data is also available and is used to estimate take. When both density and observational data are available for a given species, NMFS used the higher of the two values. NMFS used the most conservative option for estimating ensonified area for each activity as well as the most conservative estimates of the number of days of work for each activity. Note that the take estimates described below do not take mitigation and monitoring measures into account.

Takes were estimated by considering the density of marine mammals per km<sup>2</sup> multiplied by the potential area ensonified (km<sup>2</sup>) and the number of days the noise could occur during in-water construction. The Project Area is located in the nearshore environment relative to the Antarctic Peninsula as defined by data reported in Santora *et al.* (2009). Sources for density data and average group sizes are found in Table 6-3 in the application.

Note that a reference for Johnston *et al.* (2012) regarding humpback whales was inadvertently omitted from Table 6-3 in the application. The reference was used to determine average humpback whale group size. Dr. Friedlaender recommended that the humpback whale density (0.09 animals/km<sup>2</sup>) provided in that paper be used to estimate take of humpback whales. NMFS agrees with this revision and authorized take of

humpback whales by both Level A and Level B harassment has been increased accordingly in this notification of issuance.

Regarding the application of the density data for the 17 species authorized for take, for some species only offshore data were available, for some only nearshore data, and for others data existed for both areas in which case we used the higher of the two values. Offshore densities were used to estimate take for eight species, nearshore data was used for five species and local observational data was used for four species. Data from these offshore sources results in averaging across large portions of the region. NSF notes that these data are from areas where cetaceans may occur in significantly greater densities than the Palmer Pier Project Area due to expected increased faunal density along the sea ice edge and shelf-frontal features in the southern oceans. These oceanographic features are not present within the Project Area, so lower densities of cetaceans are expected within close proximity to Palmer Station. Therefore, the offshore densities may represent an overestimate of anticipated densities within the Palmer Station Project Area.

NSF estimated Level A harassment takes by multiplying the Level A harassment areas by the species density (nearshore or offshore as described above) which was then multiplied by the expected number of pile driving days for each activity type. The exposures for each activity were added to arrive at calculated Level A harassment take number as shown in Table 14. In cases where both nearshore and offshore densities were available, the higher of the two densities is used to estimate take. A similar approach was employed to derive estimated take by Level B harassment. The Level B harassment zones are determined by taking the total area of the Level B harassment zones (54.99 km<sup>2</sup>; 20.78 km<sup>2</sup>; 5.27 km<sup>2</sup>; 0.07 km<sup>2</sup>) and subtracting the Level A harassment areas as defined by activity type and hearing group.

The Level B harassment zone area was multiplied by the highest density for a species (nearshore or offshore as described above) which was multiplied by the expected number of pile driving days for each activity type. The exposures for each activity were summed to arrive at the calculated Level B harassment take numbers as shown in Table 14. Additional detailed information may be found in Appendix B of the application.

**Table 14. Calculated Level A and Level B Harassment Exposures based on Density Data**

Species	Level A Harassment Total Exposures	Level B Harassment Total Exposures
Antarctic Minke Whale (LF)	15.23	312.25
Arnoux's Beaked Whale (MF)	0.0001	0.14
Blue Whale (LF)	0.0081	0.17
Fin Whale (LF)	13.74	281.70
Hourglass Dolphin (HF)	0.32	4.94
Humpback Whale (LF)	14.72	302.18
Killer Whale (MF)	0.04	111.70
Long-finned Pilot Whale (MF)	0.01	28.19
Southern Bottlenose Whale (MF)	0.009	23.55
Sei Whale (LF)	0.04	0.84
Southern Right Whale (LF)	0.07	1.34
Sperm Whale (MF)	0.02	16.73
Antarctic Fur Seal (OW)	0.15	356.50
Crabeater Seal (PW)	119.07	6128.78
Southern Elephant Seal (PW)	0.02	1.04
Leopard Seal (PW)	0.02	1.04
Weddell Seal (PW)	3.65	187.97

In addition to considering density data presented in the literature, recent marine mammal observation data taken by bird researchers from Hero Inlet and nearby areas was considered. Palmer Station's research support staff conducted wildlife observations over

the course of 15 months, on an average of 23 days a month. Observations were made for six minutes, three times per day, at 8am, 1pm and 5pm local time. The observer stood on the current pier to collect the observations. When weather conditions would not permit observations from the pier, observations were conducted from BioLab Building's second story located close behind the pier. The notification of proposed IHA contained an error that was included in NSF's IHA application. Table 19 in the notification of proposed IHA described how many pinnipeds had been observed at Palmer Station between the periods of January 21-March 28, 2019 and October 12, 2019 – March 31, 2020. The column with the header October 12, 2019 through March 31, 2020 actually included data that was collected from March 30 to October 10, 2019. This time period was not included in Table 19 in the notification of proposed IHA. NMFS requested that NSF submit the corrected data for each of the three survey periods. The corrected table is included below as Table 15.

Table 15 shows a comparison between observational data from the Project Area (NSF, personal communication) and the calculated takes by Level A harassment based on density data.

**Table 15. Comparison of Observation Data from Hero Inlet, Gamage Point and Bonaparte Point 2019 – 2020 to Total Level A Harassment Exposure Estimates Calculated Based On Density Data**

Species	January 21 – March 28, 2019 Observations	March 30 – October 10, 2019 Observations	October 12, 2019 – March 2020 Observations
Humpback Whale (LF)	0	0	2
Antarctic Fur Seal (OW)	73	70	241
Crabeater Seal (PW)	20	24	24
Southern Elephant Seal (PW)	1	0	278
Leopard Seal (PW)	3	2	2
Weddell Seal (PW)	8	6	39

As noted above, in relation to the observational data, NMFS has re-analyzed estimated take of pinniped species in consideration of NSF's modification of the project

dates (the project schedule now runs from February, 2020 to July, 2020 instead of October/November, 2002 to April 2020) and the error in the pinniped observation data considered in the proposed IHA.

In consideration of all of the raw data across 20 months, given the short daily observation periods and the large variation in numbers (even within the same month of a different year), we elected to use the highest number of animals of a given pinniped species observed on a single day during any month of the year, and then to multiply this value by the number of planned in-water work days (89). Further, although pinniped density would typically be expected to be focused closer to shore, given potential limitations of NSF's observation methods, we elected to precautionarily increase these estimated take numbers by 50 percent. We compared the takes based on observational data to the take numbers derived from published density values (Table 14) and then authorized the larger of these two values. Density-derived takes were only greater for crabeater seals, so that is what we used in the final IHA and remains unchanged from the proposed IHA.

Regarding the estimation of take by Level A harassment, for species in which the observational data is used rather than density, we consider what proportion of the total take would appropriately, or conservatively, be expected be in the form of Level A harassment. The area encompassed above the Level A take threshold is very small compared to the area encompassed above the Level B harassment zone (Table 13) – specifically, less than 3% for the largest source and most sensitive taxa (phocids) and far smaller for other groups. Further, the implementation of shutdown zones is expected to avoid some of the higher level or longer duration exposures that might potentially result in PTS. However, given that pinnipeds would be likely to spend a larger portion of their time in closer proximity to land (and potentially the pile driving source), we deemed it appropriate to

conservatively estimate that 10 percent of the total calculated takes could potentially be by Level A harassment with the rest taken by Level B harassment.

Table 16 shows the maximum number of animals observed on a single day during any month as well as authorized takes by Level A harassment, Level B harassment and combined takes for each pinniped species. Total combined Level A harassment and Level B harassment takes have increased from 1 to 936 for southern elephant seals; from 437 to 1,335 for Antarctic fur seals; from 198 to 267 Weddell seals; and from 10 to 134 leopard seals. The density-based authorized take of crabeater seals remains unchanged at 6,249 from the notification of proposed IHA.

**Table 16. Final Authorized Takes Based on Observational or Density Data (whichever highest)**

<b>Species</b>	<b>Max # Observed per day</b>	<b>Level A</b>	<b>Level B</b>	<b>Total (Level A + Level B)</b>
Southern elephant seal	7	94	841	935
Antarctic fur seal	10	134	1,201	1,335
Weddell seal	2	27	240	267
Crabeater seal*	4	120	6,129	6,249
Leopard seal	1	14	120	134

\*Based on Density Data

Additional marine mammal observation data collected over a 5-year period at Palmer Station from January 4, 2015 through March 18, 2020 was also considered (Friedlaender, Personal Communication). The data was collected using small boats, unmanned aerial systems (UASs) and land-based surveys. The assessment of this data is described as part of the responses to Comment 1 and Comment 2.

Table 17 compares the number of calculated and authorized Level A and B harassment takes for each species. Level B harassment takes for Arnoux's beaked whale, blue whale, hourglass dolphin, sei whale, and Southern right whale have been adjusted based on group size such that a higher level of Level B harassment take has been authorized than was projected solely based on densities. Arnoux's beaked whales often



occur in groups of 6-10 and occasionally up to 50 or more (Balcomb 1989). As a precautionary measure NSF requested and NMFS has authorized 12 takes of this species by Level B harassment. Classified as HF cetaceans, these beaked whales have a relatively large Level A harassment zone that extends to as much as 4,149 m. However, calculated take by Level A harassment is fractional and furthermore, this is a deep diving and deep foraging species and it would be unlikely that animals would congregate in a Level A harassment zone long enough to accrue enough energy to experience PTS. Therefore, no take by Level A harassment was requested, nor has been authorized by NMFS. Blue whales are unlikely to be found in the Project Area. However, NSF requested and NMFS has conservatively authorized two Level B harassment takes based on one average group size (NMFS, 2020). Hourglass dolphins group size is generally 2-6 individuals with groups of up to 25 observed (Santora 2012). Classified as HF cetaceans, these dolphins have a relatively large Level A harassment zone that extends to 4,149 m. However, local observational data sets have not recorded a single animal and the species tends to be found in waters close to the Antarctic Convergence. Given this information NMFS has authorized 25 takes by Level B harassment which is a reduction from 60 takes requested by NSF. Level A harassment takes are not expected or authorized since the dolphin species is highly mobile and is unlikely to remain in the zone long enough to experience PTS. Sei whales have an average group size of 6 (NMFS 2020) and generally inhabit continental shelf and slope waters far from coastlines. They are unlikely to occur, but as a precautionary measure, NSF had requested and NMFS has authorized 6 takes by Level B harassment. Takes by Level A harassment are not expected or authorized. Southern right whales live in groups of up to 20 individuals, but are more commonly found in groups of two or three, unless at feeding grounds. Observational surveys near Palmer Station did not record the presence of these whales. Therefore, NSF requested and NMFS has

subsequently authorized 20 takes of Southern right whale by Level B harassment. No take by Level A harassment is anticipated or authorized.

**Table 17. Authorized Takes by Level A and Level B Harassment and as a Percentage of Abundance**

Species	Authorized Level A Harassment Take	Authorized Level B Harassment Take	Total Takes as Percent of Abundance
Antarctic Minke Whale (LF)	15	312	4.42
Arnoux's Beaked Whale (MF) <sup>a</sup>	0	12	Unknown
Blue Whale (LF) <sup>a</sup>	0	2	0.12
Fin Whale (LF)	14	282	19.84
Hourglass Dolphin (HF) <sup>a</sup>	0	25	0.02
Humpback Whale (LF)	15	302	2.54
Killer Whale (MF)	0	112	0.45
Long-finned Pilot Whale (MF)	0	28	0.01
Southern Bottlenose Whale (MF)	0	24	0.04
Sei Whale (LF) <sup>a</sup>	0	6	0.96
Southern Right Whale (LF) <sup>a</sup>	0	20	1.13
Sperm Whale (MF)	0	17	0.14
Antarctic Fur Seal (OW) <sup>b</sup>	134	1,201	0.05
Crabeater Seal (PW)	120	6,129	0.12
Southern Elephant Seal (PW) <sup>b</sup>	94	841	0.23
Leopard Seal (PW) <sup>b</sup>	14	120	0.06
Weddell Seal (PW) <sup>b</sup>	27	240	0.05

<sup>a</sup> Level B harassment takes increased to account for group size assuming one group is encountered during the project

<sup>b</sup> Increased from calculated exposures due to local observational data.

Table 17 also shows authorized takes by harassment for all species as a percentage of stock abundance.

## Mitigation

In order to issue an IHA under section 101(a)(5)(D) of the MMPA, NMFS must set forth the permissible methods of taking pursuant to the activity, and other means of

effecting the least practicable impact on the species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of the species or stock for taking for certain subsistence uses (latter not applicable for this action). NMFS regulations require applicants for incidental take authorizations to include information about the availability and feasibility (economic and technological) of equipment, methods, and manner of conducting the activity or other means of effecting the least practicable adverse impact upon the affected species or stocks and their habitat (50 CFR 216.104(a)(11)).

In evaluating how mitigation may or may not be appropriate to ensure the least practicable adverse impact on species or stocks and their habitat, as well as subsistence uses where applicable, we carefully consider two primary factors:

(1) The manner in which, and the degree to which, the successful implementation of the measure(s) is expected to reduce impacts to marine mammals, marine mammal species or stocks, and their habitat. This considers the nature of the potential adverse impact being mitigated (likelihood, scope, range). It further considers the likelihood that the measure will be effective if implemented (probability of accomplishing the mitigating result if implemented as planned), the likelihood of effective implementation (probability implemented as planned); and

(2) The practicability of the measures for applicant implementation, which may consider such things as cost, impact on operations, and, in the case of a military readiness activity, personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

The following mitigation measures are required in the IHA:

- NSF must avoid direct physical interaction with marine mammals during construction activities. If a marine mammal comes within 10 m of such activity,

operations must cease and vessels must reduce speed to the minimum level required to maintain steerage and safe working conditions;

- Training must occur between construction supervisors and crews and the PSO team and relevant NSF staff prior to the start of all pile driving and construction activities, and when new personnel join the work, in order to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures are clearly understood;

- Pile driving activities must be halted upon observation of either a species for which incidental take is not authorized or a species for which incidental take has been authorized but the authorized number of takes has been met, entering or within the Level A or Level B harassment zones as shown in Table 18 and Table 19;

- NSF will establish and implement a shutdown zone of 50 m for fur seals under all pile driving scenarios. The purpose of a shutdown zone is generally to define an area within which shutdown of the activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area). Shutdown zones typically vary based on the activity type and marine mammal hearing group. Shutdown zones for cetaceans and other pinnipeds are based on Level A harassment isopleths shown in Table 12. Based on observation data, fur seals are known to swim up Hero Inlet (approximately 135 m wide) to haul out. The required 50-m shutdown zone for fur seals can safely be observed, will prevent injury to seals while still allowing seals to move up the inlet where they may haul out on land, and will allow construction to continue safely and efficiently;

- Shutdown zones have been established for all hearing groups under all driving scenarios as shown in Tables 18 and 19. If a marine mammal is observed entering or within the shutdown zones indicated in Tables 18 and 19, pile driving activity must be delayed or halted;

- Monitoring must take place from 30 minutes prior to initiation of pile driving activity through 30 minutes post-completion of pile driving activity. Pre-start clearance monitoring must be conducted during periods of visibility sufficient for the lead PSO to determine the shutdown zones shown in Table 18 and Table 19 are clear of marine mammals. Pile driving may commence following 30 minutes of observation when the determination is made;

- If the shutdown zones shown in Table 18 and Table 19 are not visible due to poor environmental conditions (*e.g.*, excessive wind or fog, high Beaufort state), pile installation would cease until the entirety of the harassment shutdown zones is observable;

- If pile driving is delayed or halted due to the presence of a marine mammal, the activity may not commence or resume until either the animal has voluntarily exited and been visually confirmed beyond the shutdown zone or 15 minutes have passed without re-detection of the animal;

- If impact driving should be needed (*i.e.*, for proofing) NSF must use soft start techniques when impact pile driving. Soft start requires contractors to provide an initial set of three strikes at reduced energy, followed by a 30-second waiting period, then two subsequent reduced-energy strike sets. A soft start must be implemented at the start of each day that begins with impact pile driving and at any time impact driving would occur after cessation of impact pile driving for a period of 30 minutes or longer;

- In-water construction would occur during daylight over a 12-hour workday to minimize the potential for PTS for species that may occur within the Level A harassment zones; and

- When transiting to the site, marine mammal watches must be conducted by crew or those navigating the vessel. When in the Project Area, if a whale is sighted in the path of a support vessel or within 92 m (300 ft) from the vessel, NSF must reduce

speed and must not engage the engines until the animals are clear of the area. If a whale is sighted farther than 92 m (300 ft) from the vessel, NSF must maintain a distance of 92 m (300 ft) or greater between the whale and the vessel and reduce speed to 10 knots or less. Vessels must not be operated in such a way as to separate members of a group of whales from other members of the group. A group is defined as being three or more whales observed within a 500 m area and displaying behaviors of directed or coordinated activity (*e.g.*, group feeding).

**Table 18. Shutdown and Harassment Zones (meters) for Non-Simultaneous Pile Installation Activities (Level A harassment zone indicated in parentheses where different from shutdown zone)**

Pile size, type, and method	Cetaceans			Pinnipeds		Level B Harassment Zone
	LF	MF	HF	PW	OW	
Dock, 36-in Dia. Pile Installation, 20’ Socket Depth - 1 pile/day (DTH)	1,000 (1,981)	70	1,000 (2,253)	1,000 (1,012)	50 (74)	11,659
Dock Abutment, 36-in Dia. Pile Installation, 30’ Socket Depth - 1 pile/day (DTH)	1,000 (2,475)	90	1,000 (2,951)	1,000 (1,326)	50 (97)	
RHIB Fender Piles, 24-in Dia. Pile Installation, 20’ Socket - 1 pile/day	410	15	485	220	50	
24-in Dia. Template Piles, 10’ Socket Depth - 2 piles/day						
24-in Dia Wave Attenuator Piles, 20’ Socket Depth - 1 pile/day						
Retaining Wall HP Pile inserted in Drilled 24-in Dia Sockets, 20’ Socket Depth - 1 pile/day						
Removal of 24-in Dia. Template Piles - 16 piles	55	10	75	35	50	10,000
Removal of Sheet Piles	25	10	35	15	50	4,642
Rock Chipping/Floor Preparation	405	50	720	205	50	123
Anode Installation	10	10	10	10	50	200

**Table 19. Shutdown and Harassment Zones (meters) for Simultaneous Pile Installation Activities (Shutdown Zone (Level A harassment zone indicated in parentheses where different from shutdown zone)**

[illegible]

Based on our evaluation of the applicant's proposed measures, as well as other measures considered by NMFS, we have determined that the required mitigation measures provide the means of effecting the least practicable impact on the affected species or stocks and their habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance.

### **Monitoring and Reporting**

In order to issue an IHA for an activity, section 101(a)(5)(D) of the MMPA states that NMFS must set forth requirements pertaining to the monitoring and reporting of such taking. The MMPA implementing regulations at 50 CFR 216.104 (a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the planned Project Area. Effective reporting is critical both to compliance as well as ensuring that the most value is obtained from the required monitoring.

Monitoring and reporting requirements prescribed by NMFS should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (*e.g.*, presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) action or environment (*e.g.*, source characterization, propagation, ambient noise); (2) affected species (*e.g.*, life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (*e.g.*, age, calving or feeding areas);



- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) long-term fitness and survival of individual marine mammals; or (2) populations, species, or stock;
- Effects on marine mammal habitat (*e.g.*, marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

### *Visual Monitoring*

One NMFS-approved, formally trained PSO with prior experience performing the duties of a PSO during construction activities would serve as team leader, supported by three PSOs trained on site or through available online training programs compliant with NMFS standards. PSOs must be independent (*i.e.*, not construction personnel) and have no other assigned tasks during monitoring periods. Prior to initiation of construction, PSOs would complete a training/refreshers session on marine mammal monitoring, to be conducted shortly before the anticipated start of the open water season construction activities.

Primary objectives of the training session include:

- Review of the mitigation, monitoring, and reporting requirements provided in the application and IHA, including any modifications specified by NMFS in the authorization;
- Review of marine mammal sighting, identification, and distance estimation methods;
- Review of operation of specialized equipment (bigeye binoculars, GPS); and

- Review of, and classroom practice with, data recording and data entry systems, including procedures for recording data on marine mammal sightings, monitoring operations, environmental conditions, and entry error control.

PSOs must have the following additional qualifications:

- Ability to conduct field observations and collect data according to assigned protocols;
- Experience or training in the field identification of marine mammals, including the identification of behaviors;
- Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations;
- Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); and marine mammal behavior; and
- Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

Two PSOs must be on duty during all in-water construction activities and must record all observations of marine mammals regardless of distance from the pile being driven or covered activity. PSOs shall document any behavioral reactions in concert with distance from piles being driven or removed. PSOs are limited to monitoring no more than 4 hours per shift with sufficient breaks and no more than 12 hours per day to minimize fatigue.

The placement of PSOs during all pile driving activities will ensure that the entire shutdown zones are visible during pile installation. Should environmental conditions

deteriorate such that marine mammals within the entire shutdown zone will not be visible (e.g., fog, heavy rain), pile driving activities must be delayed until the PSO is confident marine mammals within the shutdown zone could be detected. The primary monitoring location currently utilized by NSF will be on the roof platform of the Garage Warehouse Recreation (GWR) building (approximately 20 m above sea level) to provide visual coverage of the shutdown zones, as well as the Level A harassment zones to the extent practicable. NMFS agrees that the GWR building is an appropriate monitoring location. The primary PSO can monitor the Project Area generally south-southeast while the second PSO can monitor the area generally west-southwest that may be ensonified. With reticle binoculars the distance potentially visible by a 1.8 -m tall PSO from this point would be about 4,360 m. Mounted big eye binoculars would be provided to PSOs for better coverage of the shutdown zones and the Level A harassment zones. NSF believes this location is adequate to monitor the 1,000-m shutdown zone and some of the Level A harassment zone to the extent practicable beyond 1,000 m.

### *Reporting*

A draft marine mammal monitoring report will be submitted to NMFS within 90 days after the completion of pile driving activities, or 60 days prior to a requested date of issuance of any future IHAs for projects at the same location, whichever comes first. The report will include an overall description of work completed, a narrative regarding marine mammal sightings, and associated PSO data sheets. Specifically, the report must include:

- Dates and times (begin and end) of all marine mammal monitoring;
- Construction activities occurring during each daily observation period, including the number and type of piles driven or removed and by what method (*i.e.*, impact or cutting) and the total equipment duration for cutting for each pile or total number of strikes for each pile (impact driving);
- PSO locations during marine mammal monitoring;

- Environmental conditions during monitoring periods (at beginning and end of PSO shift and whenever conditions change significantly), including Beaufort sea state and any other relevant weather conditions including cloud cover, fog, sun glare, and overall visibility to the horizon, and estimated observable distance;
- Upon observation of a marine mammal, the following information: Name of PSO who sighted the animal(s) and PSO location and activity at time of sighting; Time of sighting; Identification of the animal(s) (*e.g.*, genus/species, lowest possible taxonomic level, or unidentified), PSO confidence in identification, and the composition of the group if there is a mix of species; Distance and bearing of each marine mammal observed relative to the pile being driven for each sighting (if pile driving was occurring at time of sighting); Estimated number of animals (min/max/best estimate); Estimated number of animals by cohort (adults, juveniles, neonates, group composition, etc.); Animal's closest point of approach and estimated time spent within the harassment zone; Description of any marine mammal behavioral observations (*e.g.*, observed behaviors such as feeding or traveling), including an assessment of behavioral responses thought to have resulted from the activity (*e.g.*, no response or changes in behavioral state such as ceasing feeding, changing direction, flushing, or breaching);
- Number of marine mammals detected within each of the Level A harassment and Level B harassment zones, by species; and
- Detailed information about any implementation of any mitigation triggered (*e.g.*, shutdowns and delays), a description of specific actions that ensued, and resulting changes in behavior of the animal(s), if any.

If no comments are received from NMFS within 30 days, the draft final report will constitute the final report. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

### *Reporting Injured or Dead Marine Mammals*

In the event that personnel involved in the construction activities discover an injured or dead marine mammal, the IHA-holder must immediately cease the specified activities and report the incident to the Office of Protected Resources ([PR.ITP.MonitoringReports@noaa.gov](mailto:PR.ITP.MonitoringReports@noaa.gov)), NMFS as soon as feasible. If the death or injury was clearly caused by the specified activity, NSF must immediately cease the specified activities until NMFS is able to review the circumstances of the incident and determine what, if any, additional measures are appropriate to ensure compliance with the terms of the IHA. The IHA-holder must not resume their activities until notified by NMFS. The report must include the following information:

- Time, date, and location (latitude/longitude) of the first discovery (and updated location information if known and applicable);
- Species identification (if known) or description of the animal(s) involved;
- Condition of the animal(s) (including carcass condition if the animal is dead);
- Observed behaviors of the animal(s), if alive;
- If available, photographs or video footage of the animal(s); and
- General circumstances under which the animal was discovered.

### **Negligible Impact Analysis and Determination**

NMFS has defined negligible impact as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival (50 CFR 216.103). A negligible impact finding is based on the lack of likely adverse effects on annual rates of recruitment or survival (*i.e.*, population-level effects). An estimate of the number of takes alone is not enough information on which to base an impact determination. In addition to considering estimates of the number of marine mammals

that might be “taken” through harassment, NMFS considers other factors, such as the likely nature of any responses (*e.g.*, intensity, duration), the context of any responses (*e.g.*, critical reproductive time or location, migration), as well as effects on habitat, and the likely effectiveness of the mitigation. We also assess the number, intensity, and context of estimated takes by evaluating this information relative to population status. Consistent with the 1989 preamble for NMFS’s implementing regulations (54 FR 40338; September 29, 1989), the impacts from other past and ongoing anthropogenic activities are incorporated into this analysis via their impacts on the environmental baseline (*e.g.*, as reflected in the regulatory status of the species, population size and growth rate where known, ongoing sources of human-caused mortality, or ambient noise levels).

DTH pile installation, vibratory pile removal, limited impact pile driving for proofing, rock chipping and use of a hydrogrinder have the potential to disturb or displace marine mammals. Specifically, the project activities may result in take, in the form of Level A and Level B harassment from underwater sounds generated from pile driving activities, if individuals are present in the ensonified zone when these activities are underway.

The takes from Level A and Level B harassment would be due to potential PTS, TTS and behavioral disturbance. Even absent mitigation, no mortality or serious injury is anticipated given the nature of the activity and construction method. The potential for harassment would be further minimized through the implementation of the planned mitigation measures (see **Mitigation** section).

Effects on individual animals that are taken by Level B harassment, on the basis of reports in the literature as well as monitoring from other similar activities, will likely be limited to reactions such as increased swimming speeds, increased surfacing time, or decreased foraging (if such activity were occurring) (*e.g.*, Thorson and Reyff 2006; Lerma 2014; ABR 2016). Most likely, individuals will simply move away from the sound

source and be temporarily displaced from the areas of pile installation, although even this reaction has been observed primarily only in association with impact pile driving. If sound produced by project activities is sufficiently disturbing, animals are likely to simply avoid the area while the activity is occurring. While DTH pile installation associated with the planned project may produce sound at distances of many kilometers from the project site, we expect that animals annoyed by project sound would simply avoid the area and use more-preferred habitats. Furthermore, during any impact driving, implementation of soft start procedures will be required and monitoring of established shutdown zones will be required for all pile installation and removal activities, significantly reducing the possibility of injury. Use of impact driving will be limited to proofing of piles after they have been set in place. Given sufficient notice through use of soft start (for impact driving), marine mammals are expected to move away from an irritating sound source prior to it becoming potentially injurious. This sort of low-level localized displacement, in the absence of any specific known biologically important areas around Palmer Station, would not be expected to impact the reproduction or survival of any individuals.

In addition to the expected effects resulting from authorized Level B harassment, we anticipate that Antarctic minke whales, fin whales, and humpback whales may sustain some limited Level A harassment in the form of auditory injury, given the large PTS zones for LF cetaceans. We are also authorizing take by Level A harassment of Antarctic fur seals, crabeater seals, leopard seals, Weddell seals, and Southern elephant seals since the Level A harassment zones are large relative to the ability to detect these species and they are generally considered more likely than cetaceans to potentially remain within the nearshore Level A harassment zone for longer amounts of time. The Level A harassment zones identified in Table 11 and Table 12 are based upon an animal exposed to impact pile driving multiple piles per day. Considering the short duration to impact drive or DTH

each pile and breaks between pile installations (to reset equipment and move pile into place), this means an animal would have to remain within the area estimated to be ensonified above the Level A harassment threshold for extended periods. This is highly unlikely given typical movement of both cetaceans and pinnipeds throughout the area. However, animals that experience PTS would likely be subjected to slight PTS, *i.e.* minor degradation of hearing capabilities within regions of hearing that align most completely with the frequency range of the energy produced by pile driving, *i.e.* the low-frequency region below 2 kHz, not severe hearing impairment or impairment in the regions of greatest hearing sensitivity. If hearing impairment occurs, it is most likely that the affected animal would lose a few decibels in its hearing sensitivity, which in most cases is not likely to meaningfully affect its ability to forage and communicate with conspecifics.

The project is also not expected to have significant adverse effects on affected marine mammals' habitats. The project activities would not modify existing marine mammal habitat for a significant amount of time. The activities may increase sedimentation and cause some fish to leave the area of disturbance, thus temporarily impacting marine mammals' foraging opportunities in a limited portion of the foraging range; but, because of the relatively small area of the habitat that may be affected, the impacts to marine mammal habitat are not expected to cause significant or long-term negative consequences for marine mammals.

The nature of NSF's planned construction activities precludes the likelihood of serious injury or mortality, even absent mitigation. For all species and stocks, take would occur within a limited area (Hero Inlet and nearby waters) that constitutes a small portion of the ranges for authorized species. Level A and Level B harassment will be reduced to the level of least practicable adverse impact through use of mitigation measures described



herein. Further, the amount of take authorized is extremely small when compared to stock abundance of authorized species.

In summary and as described above, the following factors primarily support our determination that the impacts resulting from this activity are not expected to adversely affect the species or stock through effects on annual rates of recruitment or survival:

- No mortality or serious injury is anticipated or authorized;
- The relatively small number of Level A harassment exposures are anticipated to result only in slight PTS within the lower frequencies associated with pile driving;
- The anticipated incidents of Level B harassment would consist of, at worst, temporary modifications in behavior that would not result in fitness impacts to individuals;
- No adverse effects on affected marine mammals' habitat are anticipated;
- No areas that are known to be specifically important for marine mammal feeding or reproduction have been identified within the Project Area;
- For all species, Hero Inlet and nearby waters represent very small and peripheral part of their ranges; and
- The required mitigation measures (*i.e.* shutdown zones) are expected to be effective in reducing the effects of the specified activity.

Based on the analysis contained herein of the likely effects of the specified activity on marine mammals and their habitat, and taking into consideration the implementation of the required monitoring and mitigation measures, NMFS finds that the total marine mammal take from the specified activity will have a negligible impact on all affected marine mammal species or stocks.

### **Small Numbers**

As noted above, only small numbers of incidental take may be authorized under sections 101(a)(5)(A) and (D) of the MMPA for specified activities other than military

readiness activities. The MMPA does not define small numbers and so, in practice, where estimated numbers are available, NMFS compares the number of individuals taken to the most appropriate estimation of abundance of the relevant species or stock in our determination of whether an authorization is limited to small numbers of marine mammals. When the predicted number of individuals to be taken is fewer than one third of the species or stock abundance, the take is considered to be of small numbers. Additionally, other qualitative factors may be considered in the analysis, such as the temporal or spatial scale of the activities.

The amount of take authorized by NMFS is below one third of the estimated stock abundances for all 17 species. For fin whales, the authorized take of individuals is less than 20 percent of the abundance of the affected species or stock, and less than 5 percent for the remainder of the species, as shown in Table 17. This is likely a conservative estimate because it assumes all takes are of different individual animals, which is likely not the case. Some individuals may return multiple times in a day, but PSOs would count them as separate takes if they cannot be individually identified. Based on the analysis contained herein of the specified activity (including the required mitigation and monitoring measures) and the anticipated take of marine mammals, NMFS finds that small numbers of marine mammals will be taken relative to the population size of the affected species or stocks.

### **Unmitigable Adverse Impact Analysis and Determination**

There are no relevant subsistence uses of the affected marine mammal stocks or species implicated by this action. Therefore, NMFS has determined that the total taking of affected species or stocks would not have an unmitigable adverse impact on the availability of such species or stocks for taking for subsistence purposes.

### **Endangered Species Act**

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA: 16 U.S.C. 1531 *et seq.*) requires that each Federal agency insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. To ensure ESA compliance for the issuance of IHAs, NMFS consults internally whenever we propose to authorize take for endangered or threatened species, in this case with the ESA Interagency Cooperation Division.

There are five marine mammal species (blue whale, fin whale, sei whale, Southern right whale, and sperm whale) with confirmed occurrence in the project area that are listed as endangered under the ESA. The ESA Interagency Cooperation Division issued a Biological Opinion on October 25, 2021, under section 7 of the ESA, on the issuance of an IHA to NSF under section 101(a)(5)(D) of the MMPA by the NMFS Permits and Conservation Division. The BiOp concluded that the specified action is not likely to jeopardize the continued existence of endangered blue whale, fin whale, sei whale, Southern right whale, or sperm whale.

#### **National Environmental Policy Act**

NMFS has adopted NSF's Final Initial Environmental Evaluation (IEE), which is generally the equivalent of an environmental assessment (EA) under the Antarctic Conservation Act (16 U.S.C. 2401 *et seq.*). NMFS determined that the document includes adequate information analyzing the effects on the human environment of issuing the IHA. This IEE was made available to the public for review during the public comment period of the proposed IHA; we did not receive any comments from the public relevant to the IEE. A Finding of No Significant Impact (FONSI) was signed on October 27, 2021. A copy of the IEE and FONSI is available upon online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/incidental-take-authorizations-construction-activities>.

**Authorization**

NMFS has issued an IHA to NSF for the potential harassment of small numbers of 17 marine mammal species incidental to pile driving activities associated with construction of the Palmer Station Pier Replacement project at Anvers Island, Antarctica, provided the previously mentioned mitigation, monitoring and reporting requirements are followed.

Dated: November 2, 2021.

**Kimberly Damon-Randall,**

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